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Exclusive formation of imino[4 + 4]cycloaddition products with biologically relevant amines: Plausible candidates for acrolein biomarkers and biofunctional modulators

Tsutsui A., Pradipta A., Saigitbatalova E., Kurbangalieva A., Tanaka K.
Kazan Federal University, 420008, Kremlevskaya 18, Kazan, Russia

Abstract

© 2015 The Royal Society of Chemistry. We synthetically demonstrate that eight-membered heterocycles, namely, 2,6,9-triazabicyclo[3.3.1]nonanes and 1,5-diazacyclooctanes, are the exclusive products of the reaction of acrolein with biologically relevant amines via an imino[4 + 4]cycloaddition. These compounds are produced in much higher amounts and efficiencies than the acrolein biomarker in current use, 3-formyl-3,4-dehydropiperidine (FDP). Our results not only indicate that eight-membered heterocycles may potentially be used as new biomarkers, but also strongly suggest the involvement of these heterocycles in various important biological phenomena, e.g., an acrolein-mediated mechanism underlying oxidative stress.

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